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ARTICLE

China's Comprehensive Disaster Reduction

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Abstract China is one of the countries in the world that are most affected by natural disasters. In recent years, with global climate change and rapid socioeconomic development in the country, natural disaster risks have been increasing and economic losses and the population affected have shown a growing trend; catastrophic disasters have repeatedly ravaged China, causing major socioeconomic impacts.

The Chinese government attaches great importance to disaster prevention, reduction, and relief. Developments in laws and regulations on natural disaster management in the past three decades have provided an improved legal framework for disaster prevention, reduction, and relief. China's disaster relief is guided by the principle of people-centered, government-led, multilevel management, mutual support within social networks, and self-rescue of victims. Through the years, the government has been expanding the scope of disaster relief and increasing the level of assistance, strengthening integrated coordination mechanisms, and standardizing procedures for relief work. Disaster prevention, reduction, and relief mechanisms based on China's situation, and with Chinese characteristics, have been established. Attention has also been given to capacity-building. Much effort has been made to implement disaster reduction projects and to improve early warning systems, emergency response, science and technological support, human resource development, and community disaster relief systems. Future disaster reduction efforts of the Chinese government will focus on alleviating the impact of natural disasters, coping with catastrophic disaster risks, harmonizing the relationship between humans and nature, and attaining sustainable development.

Keywords China, comprehensive disaster reduction, disaster relief, natural disasters

1 The Situation of Natural Disasters and the Impact of Catastrophes in China

In the past decades, with global climate change featuring mainly global warming, occurrences of extreme weather and climate events have become more frequent. Especially since the 1990s, with the country's economy running on a new fast track, China has suffered through a period of frequent disaster impacts. Flood and waterlogging, drought, typhoon, earthquake, fire, plant disease and insect pest, landslide, and mud-rock flow have followed one another with growing frequency. The increasing trend of losses is notable and catastrophes have ravaged China from time to time, causing great socioeconomic impacts.

1.1 The Increasing Trend of Disaster Losses

Since the founding of the People's Republic of China, the losses caused by disasters have been on a rising track. Average annual disaster losses in the 1950s stood at RMB 47.6 billion yuan, which was vastly exceeded by the RMB 106.4 billion yuan in average annual losses during the early 1990s (calculated on the basis of comparable prices in the 1990s; the same reference point applies to all statistics used throughout this article). According to available statistics, between 1978 and 2009, on average 360 million people were affected by natural disasters, close to 8000 people died, over 8.5 million people were evacuated and resettled, 45.65 million hectares of cropland were impacted, and over 3 million houses collapsed every year. The average annual direct economic loss surpassed RMB 220 billion yuan (all statistical data in this section from Department of Disaster Relief, Ministry of Civil Affairs of the People's Republic of China (2010), and the Ministry of Civil Affairs Disaster Database (internal)).

As shown in Figure 1, since 1978, except for a conspicuous decrease in the number of deaths, all other indicators of natural disaster losses in China were on the rise. Especially since the 1990s, as the country's economy rapidly grew, the losses caused by various disasters have shown a remarkable upward trend, as can be seen in Figure 2. Specifically, the average annual direct economic loss in the 1990s exceeded that of the 1980s by 228 percent, and the average annual direct economic loss in the 2000s exceeded that of the 1990s by 75.8 percent. The various indicators, such as the affected population, the number of people evacuated and resettled, and the area of crop failure, have been increasing to varying degrees. If the year 2008, in which a great number of people died, is excluded from the analysis, and excepting the decreasing number of deaths and collapsed houses, other disaster loss indicators have all increased compared with

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those of the 1990s. This is especially true for direct economic losses, the evacuated and resettled population, the affected population, and the area of crop failure, which have all increased by a margin of over 40 percent, and some by a margin of over 100 percent (Table 1).

1.2 Socioeconomic Impacts of Major Disasters

In the past few decades, major catastrophes occurred frequently in China, posing great obstacles to the socioeconomic development of the country. As revealed by incomplete statistics, more than 40 major and extraordinary disasters have occurred in the past 30 years, with an average annual frequency of one to two occurrences. Among these disasters, earthquakes, floods and waterlogging, typhoons, and droughts are the major types. Others include forest fires, major landslides, and low temperature events combined with freezing rain or snow. These major disasters also included some catastrophes that had rarely occurred in history (Department of Disaster Relief, Ministry of Civil Affairs of the People's Republic of China 2010).

The socioeconomic impacts of such catastrophes are vast in area, deep in impact, and complicated and various in type. Catastrophes seriously threaten the life and mental health of the affected people, cause great losses to properties, pose obstacles to the sustainable development of society and economy, destroy ecological resources and the environment, and impact social stability and public security. How to cope with major disasters is a paramount issue faced by China in an effort to comprehensively reduce disaster consequences, both at present and in the future.

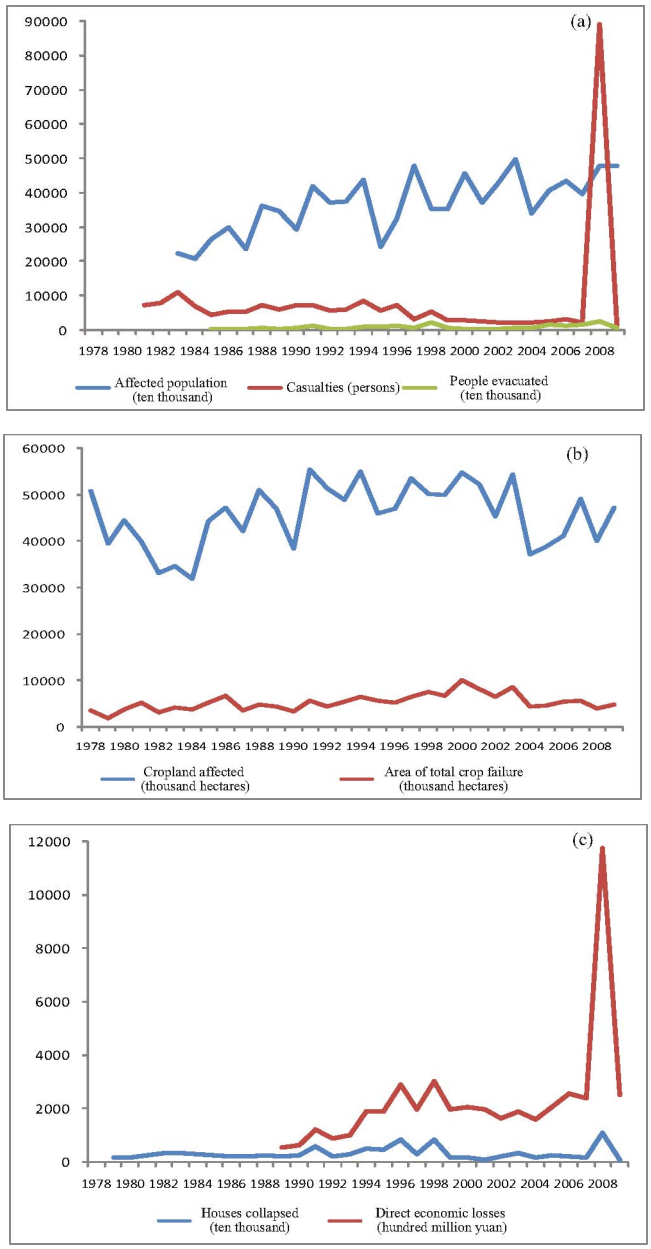

Figure 1. Temporal change of disaster-affected population (a), cropland (b), and disaster losses (c) in China, 1978–2009
Source: Data from the Ministry of Civil Affairs Disaster Database (internal).

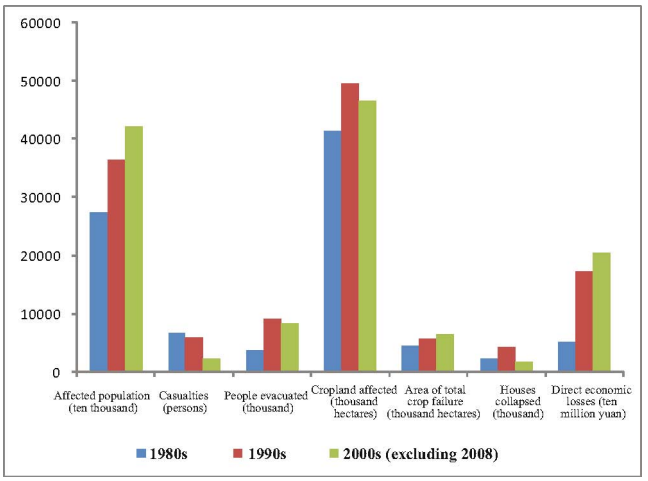

Figure 2. Comparison of the average annual disaster losses in China in the 1980s, 1990s, and 2000s
Source: Data from the Ministry of Civil Affairs Disaster Database (internal).

2 China's Comprehensive Disaster Reduction Structure

Guided by the principle of "the Rule of Law," China has issued and implemented a series of disaster reduction laws and regulations as the basis of its disaster reduction efforts. The scientific concept of development, which aims at a harmonious development between humans and nature, requires China to include disaster reduction into its national strategy of sustainable development. China adopts a hierarchical management system for disaster reduction, with the central government as the top leader and different government departments shouldering various responsibilities. It has developed a disaster reduction mechanism with Chinese characteristics in line with China's realities and based on its

Table 1. Major catastrophes in China since 1998

Catastrophe	Affected Areas and Impact
The Great Flood in 1998	Great floods occurred in major rivers including the Yangtze River, Songhua River, Pearl River, and Min River. The floods that occurred in the Yangtze River Basin and Xi Jiang of the Pearl River Basin ranked second largest in terms of flood level since the founding of the People's Republic of China (PRC). The floods that occurred in the Songhua River and Min River ranked first in terms of flood level since the founding of the PRC. In the ten provinces Inner Mongolia, Jilin, Heilongjiang, Anhui, Fujian, Jiangxi, Hubei, Hunan, Guangdong, and Guangxi, 120 million people were affected, with the number of those killed or missing exceeding 2000, over 15 million hectares of cropland were affected, nearly 6 million houses collapsed, and direct economic losses totaled over RMB 200 billion yuan.
The three-year-long drought in 1999–2001	A three-year-long drought affected China during 1999–2001, with an area of impact, duration, and induced losses rarely seen in history. The years 2000 and 2001 ranked first and third respectively in terms of drought impact since the founding of the PRC. In 2000, more than 40 million hectares of cropland were affected, and 38 million people and 24 million livestock suffered from water shortage due to the drought.
The Great Drought in Sichuan and Chongqing in 2006	The great drought in Sichuan and Chongqing in 2006 was the most severe since meteorological records became available in 1891. According to the statistics, more than 60 million people were affected to varying degrees in this disaster, 150,000 people were evacuated, and over 300,000 were injured or contracted diseases.
Low temperature, heavy snow and freezing rain in southern China in early 2008	Railway, highway, and civil aviation networks in a vast area were obstructed, transportation of coal and oil and transmission of electricity were suspended, great numbers of passengers were stranded in stations, and telecommunication, water supply, and heating facilities were affected in many regions. The direct economic loss ran to over RMB 150 billion yuan.
The Great Earthquake in Wenchuan in 2008, with a magnitude of 8.0	This is the most destructive earthquake on record, with the largest area of impact and the greatest difficulties for disaster relief since the founding of the PRC. The toll of killed and missing people reached 87,150 in this disaster.
The great drought in the five provinces of southwest China in 2009–2010	Emerging in the autumn and winter of 2009, this drought lasted for six months. More than 70 million people were affected, and at its peak over 20 million people and 30 million livestock suffered from temporary water shortage.
The earthquake in Yushu in 2010, with a magnitude of 7.1	On this occasion 2968 people were killed or missing. Gyêgu Town, the seat of government for the Yushu Tibetan Autonomous Prefecture and the government of Yushu County, was destroyed.
The severe flood and waterlogging in 2010	Nearly 20 provinces and 200 million people were affected. The number of people killed or missing exceeded 2000, the number of collapsed houses stood near 2 million, and direct economic losses exceeded RMB 300 billion yuan.
The great mountain torrents and mud-rock flow in Zhouqu in 2010	More than 1700 people were killed or missing. Over 300 houses were destroyed in the county seat and a large number of houses were affected by the flood. Transportation, water supply, electricity, and telecommunication were all cut off.

Source: Data from Department of Disaster Relief, Ministry of Civil Affairs of the People's Republic of China (2010), and the Ministry of Civil Affairs Disaster Database (internal).

past experiences. Attention has also been given to capacity-building. Much effort has been made to implement disaster reduction projects and to improve early warning, emergency response, science and technological support, human resource development, and community disaster relief systems.

2.1 Legal Framework Development

China attaches great importance to legislation regarding disaster prevention and reduction and has enacted a number of laws and regulations in this regard, thus gradually institutionalizing its disaster reduction efforts. Since the early 1980s, the state has promulgated more than 30 laws and regulations concerning disaster prevention and reduction[1].

The Chinese government has for years persisted in incorporating disaster reduction in the sustainable development strategies at the national and local levels. In *China's Agenda 21* issued in March 1994, the central government clearly defined the relations between disaster reduction and environmental protection at the national level, placing as major concerns on its agenda the construction of a disaster prevention and reduction system and the reduction of human factors in triggering or worsening natural disasters. In April 1998, the state released the *Disaster Reduction Plan of the People's Republic of China (1998–2010)* (State Council of the People's Republic of China 1998), which was published, for the first time in China, in the form of specialized plans. It puts forward the guidelines, goals, tasks, and methods of disaster reduction work. In October 2006, the *11th Five-year Plan for the Development of Science and Technology* (Ministry of Science and Technology of the People's Republic of China 2006) was released, in which the Chinese government included as major tasks the technological development for a public security emergency response system and the enhancement of the nation's capabilities in handling public security, disasters, and unexpected public incidents. In August 2007, the Chinese government issued the *National Plans for Comprehensive Disaster Reduction in the 11th Five-year Plan Period* (State Council of the People's Republic of China 2007), requiring local governments to include disaster reduction in their social and economic development plans.

2.2 Institutional Setup

China's disaster reduction and relief is guided by the principle of people-centered, government-led, multilevel management, mutual support within social networks, and self-rescue of victims. This principle is a summary of the historical experience of China's disaster reduction and relief, as well as an epitomization of the present state of disaster management work. China has adopted a disaster reduction and relief system featuring central leadership, departmental responsibility, and disaster administration at different levels with major responsibility on local authorities. Under the unified leadership of the State Council, the central organs coordinating and organizing disaster reduction and relief work are the National Disaster Reduction Committee, the State Flood and Drought Control Headquarters, the State Earthquake Response and Rescue Headquarters, the State Forest Fire Control Headquarters, and the National Disaster Control and Relief Coordination Office. Local governments also have set up corresponding coordination offices to handle disaster reduction and relief work. During disaster reduction and relief work, the People's Liberation Army, the Armed Police, militiamen, and reservists, as well as policemen, play a major role, and often act as task forces. Social groups, nongovernmental organizations, and volunteers also join in supporting relief efforts.

2.3 Working Mechanism Development

With years of experience in disaster reduction and relief, the Chinese government has established a series of disaster reduction and relief mechanisms geared to the nation's situation, including a disaster emergency response system; disaster information release system; emergency relief material reserve system; disaster early warning consultation and information-sharing system; major disaster rescue and relief joint coordination mechanism; and disaster emergency response public mobilization mechanism. Local governments at various levels also have similar working mechanisms.

Disaster Emergency Response System: The emergency response system of the central government for unexpected natural disasters operates at three levels through the state overall emergency response plan, the state specialized emergency response plans, and the departmental emergency response plans. Detailed measures and working regulations are worked out by the relevant government departments in line with the specialized plans and their respective responsibilities. In the wake of a major natural disaster, under the unified leadership of the State Council, the relevant departments with different focuses act in coordination and launch emergency response plans to guide disaster control and relief work. The governments of the affected areas immediately start emergency response measures and set up a local disaster emergency response command with the heads of the local governments serving as the chief commanders, and leaders of relevant departments as members. These officials jointly draw up emergency plans and measures, organize field emergency response work, and report disaster details and work progress to governments of higher levels and relevant departments.

Disaster Information Release System: Following the principle of "being prompt and precise, open and transparent," the central and local governments are expected to release promptly emergency information concerning natural disasters and other emergencies. Through authorized news announcements, press releases, interviews, and press conferences government bodies provide to the public information on the disasters and their developments, progress of emergency response work, disaster prevention, and knowledge on disaster prevention and other information, thus ensuring the public's right to know about and to monitor current developments.

Emergency Relief Material Reserve System: China has built a relief material reserve network based on special storehouses, which has seen year-by-year improvements. The country now has ten such storehouses for daily necessities at the central level, and storage centers for relief supplies, and flood and forest fire control supplies are continuously being built and improved. Coupled with the relief material reserve and supply centers established in some provinces, cities, and counties, a preliminary disaster control and relief material reserve system has taken shape. To guarantee the timely purchase of relief supplies, a list of commissioned relief supply manufacturers has been established, and purchase agreements have been signed with them for the supply of relief materials in the case of emergency.

Disaster Early Warning, Consultation and Information-sharing System: This system has been set up to involve relevant government departments such as civil affairs, land resources, water resources, agriculture, forestry, statistics, seismology, maritime affairs, and meteorology. To offer timely and effective support for the decision making of the central government and local departments in the case of emergency, China has initiated the construction of a disaster information database. The country also has launched a public platform of national geographical information and a disaster information publishing and sharing system, as well as a platform for national disaster reduction and risk management information.

Major Disaster Rescue and Relief Joint Coordination Mechanism: In the wake of a major disaster, relevant departments are expected to play their roles and dispatch to disaster-hit areas in timely fashion working groups composed of personnel from these departments to gather firsthand information and guide disaster control and relief work on the spot. The groups are also required by the State Council to coordinate with the relevant departments to map out rescue plans, help with disaster relief work, and prevent possible secondary disasters.

Disaster Emergency Response Public Mobilization Mechanism: A preliminary public mobilization system is now in place, focusing on efforts for rescue, search, first aid, relief, donations, and other work. The government also encourages

the full participation of nongovernmental organizations such as the Red Cross, autonomous organizations at the grassroots level, and individual volunteers in the areas of disaster prevention, emergency rescue, relief and donation work, medical assistance, hygiene and quarantine work, postdisaster reconstruction, psychological therapy support, and so forth.

International Cooperation and Communication Mechanism: Adopting an open and cooperative attitude, China takes an active part in international efforts in the area of disaster reduction, in the construction and improvement of an international cooperative disaster reduction mechanism, in building up a worldwide capacity in this regard, and in providing mutual aid to other countries in major natural disasters. China carries out close cooperation with the United Nations, promotes the setup of a platform for conversation and exchange on disaster reduction between Asian countries, strengthens cooperation with countries in the Association of Southeast Asian Nations (ASEAN) in the building up of disaster reduction capabilities, and promotes the synergy of these collaborations among member countries of the Shanghai Cooperation Organization[ii]. China and the international community have been continuously assisting each other in tackling major natural disasters. In the aftermath of the catastrophes such as the Indian Ocean Earthquake and Tsunami, the South Asia Great Earthquake, and the Burma Nargis Tropical Storm, the Chinese government offered timely assistance to the disaster-affected countries and dispatched rescue teams and health-care teams to the disaster-hit areas. After the Wenchuan Earthquake, governments, groups, and individuals from more than 160 countries and regions, and many international organizations, have successively offered China a great amount of capital and material assistance through various channels.

2.4 Capacity Building

The Chinese government also attaches great importance to the enhancement of disaster reduction capacities. It has made great efforts in undertaking disaster reduction projects, improving disaster early warning and emergency response, enhancing science and technological support, and strengthening personnel training and disaster reduction work in communities.

Construction of Disaster Reduction Projects: China sticks to the principle of taking prevention as the main task and carrying out active prevention in its disaster reduction efforts. It has increased investment in key projects and facilities that are aimed at flood prevention and drought relief, earthquake resistance, storm resistance, desertification control and rehabilitation, and ecological improvement. A series of core disaster prevention and relief projects have been established, such as the Three Gorges Project, Gezhouba Project, Xiaolangdi Project, the Three-North Shelter Forest, and the Beijing and Tianjin Sandstorm Source Control Project. China has also carried out various projects to rebuild dilapidated houses of poor people in rural areas and the dilapidated school buildings, to remove potential hazards and carry out necessary reinforcement of reservoir dams, to ensure the safety of drinking water in rural areas, to prevent and control soil erosion in key areas, and to improve in general the ecology and environment of the national territory. With these efforts the disaster prevention and reduction capabilities of key areas and urban and rural areas as a whole have been effectively enhanced.

Construction of the Monitoring, Early Warning and Forecasting System: Abiding by the laws for comprehensive disaster reduction, a monitoring, early warning, and forecasting system has been established. This is a three-dimensional natural disaster monitoring system that includes ground monitoring, ocean and ocean bottom monitoring, and space-to-ground monitoring. With regard to meteorological disaster monitoring and forecasting, a weather monitoring and forecasting network has been formed, which consists of 2456 ground weather stations, 120 upper air stations, and 118 new-generation weather radars. In earthquake monitoring and forecasting, an observation network for precursors of earthquakes has been formed. This early warning system is made up of the National Digital Earthquake Network (including 152 earthquake stations), the network of 31 provincial-level regional digital remote monitoring stations, 25 GPS datum stations for continuous observation, and more than 400 basic stations. With regard to the early warning and forecasting of disastrous floods in big rivers, a hydrological monitoring system has been established that includes 3171 basic hydrological stations, 1244 water-level observatories, 14,602 precipitation gauging stations, 61 experimental stations, and 12,683 groundwater observatories. With regard to the prevention and early warning of fire and pest infestation in forests and grasslands, 2867 quarantine stations for preventing and controlling plant diseases and insect pests, 3151 command offices for forest fire prevention, 1222 lookouts for forest fires, 300,000 kilometers of access roads for fire prevention, and 1.03 million kilometers of fire breaks have been established, which together form a network for forest fire prevention and forest plant disease and insect pest monitoring and forecasting. For monitoring and forecasting plant diseases and insect pests that occur in farmlands and forests, the country has established more than 600 regional stations for pest monitoring and forecasting. In terms of the monitoring of disaster risk in the marine environment, a three-dimensional monitoring system for the ocean has been established that incorporates over 70 onshore bases and various types of buoys, research vessels, satellites, and airplanes. With regard to the early warning and forecasting of geological disasters, networks for mass monitoring and prevention have been constructed in areas that are troubled with frequent geological disasters. With regard to the investigation, gathering statistics, and reporting of disaster information, a national disaster reporting system has been established at the provincial, municipal and county levels. This data collection system enables 98.8 percent of municipalities and 90.6 percent of counties and districts to report disasters in

a timely fashion and greatly enhances the effectiveness and capabilities of governments at all levels in their handling of disasters.

Construction of the Disaster Relief and Emergency Response System: This system has taken initial shape, with an emergency rescue team system, emergency response mechanism, and emergency fund appropriation mechanism as its main components. Emergency handling capacities such as emergency rescue, transportation support, daily living assistance, sanitation, and epidemic prevention have been greatly enhanced.

(1) An emergency rescue team system has taken initial shape, with the public security forces, armed police, and armed forces as the main task force, with special teams such as flood fighting and emergency rescue, earthquake relief, forest fire fighting, maritime search and rescue, mine rescue, and medical care teams as the basic force, and full-time and part-time teams attached to enterprises and public institutions and emergency volunteers as the backup force. Construction of the state's land and air search and rescue base has been accelerated, and emergency rescue equipment has been further improved.

(2) The central government-stipulated responses to unexpected natural disasters are divided into four levels, which are determined by the degree of damages experienced. The concrete response measures at different levels have been expressly defined, and disaster relief work has been incorporated into a standard management process. The establishment of a disaster rescue emergency response mechanism basically guarantees that people affected by a disaster can receive aid within 24 hours. They are supplied with food, clothing, clean water, shelter, medical care, and schooling.

(3) A disaster relief emergency fund appropriation mechanism of the central government has been established, including funds for daily living of those affected by natural disasters, funds for severe flood control and drought combat, funds for repairing roads damaged by floods, funds for inland waterway channel emergency repair, funds for emergency medical assistance, funds for cultural, educational, and administrative endeavors, and funds for disaster relief in agriculture and forestry. The disaster relief management system characterized by management of disaster relief and burden-sharing of funding by different levels of governments is being actively promoted. Disaster relief contribution from local governments must be secured so as to ensure the basic living of people affected by disasters.

Disaster Reduction Science and Technology Support System: Great importance is attached to the role of science and technology in disaster prevention and reduction and efforts have been made to continuously improve the scientific and technological aspects of disaster prevention and reduction by measures such as formulating a special disaster prevention and reduction science and technology development plan, establishing a emergency response mechanism applying advanced science and technology, and starting up a series of research and development projects.

Personnel Training System: Education of disaster prevention and reduction personnel is incorporated into the national talent development program. A national education system and a training platform for disaster reduction have been gradually established.

Disaster Reduction Capacity Building in Communities: Disaster reduction capacity building in communities is being carried out in a comprehensive way. The ability of local communities to fend off disaster risks has been gradually improved. Communities are guided in drawing up plans for emergency response to disasters and carrying out related exercises on a regular basis. Public facilities and equipment for disaster reduction in communities are improving steadily. Communities are also organized to carry out disaster reduction public campaign and education. Disaster reduction demonstration communities have been set up as models. By December 2009, 687 communities had been awarded the title of National Comprehensive Disaster Reduction Demonstration Community by the state.

3 Prospects for the Development of Comprehensive Disaster Reduction in China

China has made great strides in comprehensive disaster reduction. In the next step, the government will maintain its philosophy of giving equal priority to comprehensive disaster reduction and disaster emergency management. The government also attaches importance to disaster risk management, especially to community risk management that tangibly incorporates comprehensive disaster reduction into the sustainable development plans of the central and local governments. Efforts to increase adaptation towards global climate change and further the application of financial instruments in disaster risk sharing continue to be high priority goals.

3.1 Setting Equal Priorities for Comprehensive Disaster Reduction and Emergency Management

One of the most prominent problems of China's disaster management work in the past has been that emphasis was put on handling disaster impacts rather than preventing them. With the continuous development of a system for disaster management in China, a working mechanism that puts equal emphases on comprehensive risk reduction and emergency management has been strengthened. Comprehensive risk reduction is a national strategy that comprehensively enhances disaster reduction capacities in the long run. Emergency management in the face of abrupt natural disasters is an important aspect of China's comprehensive risk reduction capacity and a key factor in reducing disaster losses. With the ever increasing complexity of disaster risks induced by global climate change and the high frequency of sudden

disastrous events, the principle of giving equal attention to comprehensive risk reduction and disaster emergency management must be continuously applied. As emergency response capacities are being continuously enhanced, disaster risk management abilities should also be strengthened and comprehensive risk reduction should be incorporated substantially into national and local development strategies, so that lives and properties can be effectively protected and disaster losses reduced.

3.2 Incorporating Comprehensive Disaster Reduction into Sustainable Development Plans

Socioeconomic development, while bringing benefits to human beings, also leads to the deterioration of the environment, which in turn poses obstacles to further development of society and economy. How to coordinate the relation between economic development and ecological environment protection so as to live in harmony with nature and reduce disaster losses has become a key subject that has to be tackled by our generation. In August 2007, China promulgated the *National Plans for Comprehensive Disaster Reduction in the 11th Five-year Plan Period* (State Council of the People's Republic of China 2007), which made a clear requirement that local governments incorporate disaster reduction into the local plans for socioeconomic development. On 11 May 2009, the Information Office of the State Council released a white paper titled *China's Disaster Reduction* (Information Office, State Council of the People's Republic of China 2009), in which it was made explicit that the Chinese Government maintains the policy of incorporating disaster reduction into the national and local sustainable development strategies. Tangible incorporation of comprehensive disaster reduction into the national and local sustainable development strategies is a key issue that is to be addressed in the next step. First, the legal system must ensure that comprehensive disaster reduction is incorporated as an important component in the sustainable development plans in different regions in order to provide the legal basis for comprehensive disaster reduction. Second, regional risk levels must be incorporated as one of the important basic data sets in the formulation of sustainable development plans in various regions and these plans need to consider the comprehensive disaster risk levels of different regions from the source. Third, government must incorporate comprehensive disaster reduction capacity building as an organic part of regional socioeconomic development, so as to keep it in unity with the socioeconomic progress.

3.3 Attaching Greater Importance to Disaster Risk Management and Community Risk Management

Disaster risk management is a systematic process. The government issues administrative commands and relies on its various departments and organizations to implement the strategies, policies, and improved measures required to reduce the negative impact that might be caused by disaster-inducing hazards. At present, China has already put in place an initial bottom-up disaster information transmission and sharing mechanism and an initial top-down construction/allocation mechanism for projects and resources used for disaster risk reduction. A system for comprehensive disaster risk management has been gradually formed. Yet further work is needed to consolidate the functions of disaster risk management. Disaster risk management should guide the implementation of the series of actions and measures for comprehensive disaster reduction so as to accomplish the goals of reducing the impact of disasters and ensuring the effective handling of emergencies.

Community is the smallest unit in the system for disaster risk management and is the very basic unit for actually carrying out risk reduction measures. It shoulders the tasks of collecting, verifying, and reporting firsthand information on disaster risks and initiating the planning, construction, and management of projects and resources for disaster risk reduction. One of the major trends in international efforts at disaster reduction is to strengthen disaster risk management at the community level. In recent years, some progress has been made in China's community disaster reduction efforts. But special attention still has to be paid to community disaster risk management and further efforts should be made to promote the continuous improvement of community disaster reduction capacities and actually reach the goal of reducing risks. Special importance should be attached to the identification, monitoring, and early warning of disaster risks. Surveys should be conducted on projects and available resources for community disaster reduction, and efforts should be made to improve the system for emergency planning and emergency response drills against disasters in urban and rural communities. Special efforts should be made to strengthen the planning, construction, demonstration, and extension of emergency shelters in high-risk areas. Depending on the recipients, various types of program should be adopted in the education and training of disaster risk reduction in order to raise to the maximum possible extent the disaster risk awareness and disaster reduction abilities of the residents in local communities.

3.4 Establishing Urban Disaster Prevention and Reduction Systems

The statistics on natural disasters in the last one hundred years have demonstrated that urban systems have been exposed to ever more severe threats by natural disasters. China is one of the countries that most affected by natural disasters. Various types of disasters occur with high frequency in vast areas of China, causing great losses. Nearly half of the cities in China are located on earthquake belts. The vast coastal regions suffer severely from typhoons and storm tides. High concentration of population, accumulation of wealth, and complex infrastructures make cities vulnerable to potential loss from

natural disasters. Currently, many cities in China are not protected enough from the onslaught of natural disasters and thus run very high risk of casualties and economic losses once a natural disaster actually occurs. The focus of China's disaster management has been traditionally on rural areas, leaving the cities rather weak in disaster forecasting, early warning, emergency response, recovery, and reconstruction. Establishing comprehensive risk management and emergency relief systems in cities and improving their disaster prevention and reduction capacities, will contribute to the reduction of disaster-induced losses and serve as an important guarantee for the realization of sustainable development of the country's economy and society.

3.5 Strengthening Catastrophe Response Capacities

Causalities and property losses caused by catastrophes and major disasters are much more severe than those caused by ordinary disasters. The magnitude and complexity of the social impact of catastrophes far surpass those of major, medium, and small disasters. What is more, the difficulties in emergency response, socioeconomic recovery, and reconstruction due to catastrophes are much greater and ever more complicated than those caused by ordinary disasters. At present, there has not been sufficient research and practical experience in catastrophe definition, forecasting, comprehensive management of catastrophe risks, catastrophe prevention and emergency response, and catastrophe relief and post-catastrophe reconstruction. A catastrophe response mechanism has not been fully established in China and the response capacities need to be strengthened urgently.

3.6 Enhancing Adaptation towards Global Climate Change

Global climate change, prominently manifested through global warming, will bring a multidimensional impact to the distribution of disaster risks and patterns of disaster occurrence in China. Confronted with the negative impact of increased disaster risks caused by global climate change, adaption will become one of the effective measures adopted by the Chinese government in promoting regional comprehensive disaster reduction. The government will emphasize research on the theory of adaptation towards global climate change, investigate the relationship between adaptation towards disasters and adaptive capacities, response capacities, and vulnerability and resilience, and construct an adaptation theory for reducing regional disaster risks. China will make more vigorous efforts to help those disadvantaged and highly vulnerable regions and groups affected by global climate change. It will strengthen regional adaptation to the impact of climate change to lower the vulnerability and increase the resilience of different regions in China in the face of disasters, and gradually increase their comprehensive disaster risk reduction capacities.

3.7 Expanding the Application of Financial Instruments in Disaster Risk Sharing

The present mechanism for transferring and sharing disaster risks in China is dominated by the division of administrative power between the central government and local governments in disaster relief and supplemented by mechanisms of public cooperation in disaster management. The mechanism of financial insurance, as a new form of transferring and sharing disaster risks, can reduce the impact of catastrophes on production and people's lives. In the past decade, the insurance industry has burgeoned in China, making significant progress in increasing total assets, number of insurance companies, amount of insurance fees, and so on. But catastrophe insurance has been developing at a rather slow pace, playing only a limited role in sharing catastrophe risks. There is still a major gap between China and countries where disaster insurance is more mature. The system of disaster insurance should be developed quickly, based on China's current situation and taking into account international experiences and best practices. The key areas for furthering the application of financial instruments in disaster risk sharing are: (1) provide a legal basis for the formation of a system for catastrophe insurance and related work; (2) strengthen the cooperation among relevant government departments to ensure the setup of a mechanism for catastrophe insurance; (3) put in place a multilayered system for dispersed insurance coverage, disperse risk through insurance and reinsurance; (4) strengthen the application of risk analysis and assessment in catastrophe insurance; (5) learn from other countries' experience in the construction of systems for catastrophe risk insurance and their operations; and (6) explore a catastrophe insurance system that has Chinese characteristics.

4 The Way Forward

The 2004 Indian Ocean earthquake and tsunami, the 2008 Wenchuan earthquake in China, the 2010 Haiti and Chile earthquakes, and the very recent Yushu earthquake and Zhouqu mountain torrents and mud-rock flows in China all alert us that frequent natural disaster events directly jeopardize human wealth and civilization and slow the development of human society. In recent years, globalization has progressed at a rapid pace, the impact of climate change has become increasingly evident, and large-scale and catastrophic disasters have occurred at a high frequency. These changes present new challenges for governments around the world in disaster reduction and relief. The Chinese government will continue to place high emphases on integrated disaster risk reduction, and improve its work on risk governance and emergency response, integrated disaster risk reduction and sustainable development, risk management by governments and communities, urban and rural disaster reduction, and government disaster relief and disaster insurance, in order to contribute to the serious endeavor of disaster reduction in the world.

Notes

i These laws and regulations include the *Emergency Response Law of the People's Republic of China, Law of the People's Republic of China on Water and Soil Conservation, Law of the People's Republic of China on Protection Against and Mitigation of Earthquake Disasters, Water Law of the People's Republic of China, Flood Control Law of the People's Republic of China, Law of the People's Republic of China on Desertification Prevention and Rehabilitation, Meteorology Law of the People's Republic of China, Forestry Law of the People's Republic of China, Marine Environment Protection Law of the People's Republic of China, Flood Control Regulations of the People's Republic of China, Forest Fire Control Regulations of the People's Republic of China, Grassland Fire Control Regulations of the People's Republic of China, Regulations on the Prevention and Control of Forest Plant Diseases and Pest Infestations, Regulations on the Prevention and Control of Geological Disasters, Regulations on the Handling of Destructive Earthquake Emergencies,* and *Regulations on the Security Control of Reservoirs and Dams.* On 30 June 2010, the 117th executive meeting of the State Council ratified the *Regulations for Natural Disaster Relief*, which has gone into effect September 1. This document provides the legal support for improved natural disaster relief work, marking the legalization of China's natural disaster relief work.

ii The Shanghai Cooperation Organization (SCO) is an intergovernmental mutual-security organization which was founded in 2001 in Shanghai by the leaders of China, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan.

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